

REMARKS

In response to the Official Action mailed on June 10, 2010, the application has been amended. No new matter has been added. Reconsideration of the rejections of the claims is respectfully requested in view of the above amendments and the following remarks.

On page 2 of the Official Action, claims 11 - 14 were rejected under 35 USC 103(a) as unpatentable over JP 08-125327-A (referred to below as Takahashi) in view of Kondo (U.S. Patent No. 4,938,410) and Mizoguchi et al (U.S. Patent No. 5,567,151, referred to below as Mizoguchi). This rejection is respectfully traversed.

Claim 11 describes a heater having partitions which slope towards each other at an upper end of a suction chamber and a perforated plate at the upper end of discharge chambers disposed on opposite sides of the suction chamber. The cited references do not disclose or suggest such an arrangement.

Takahashi discloses a reflow furnace having a plurality of box-shaped heaters 1. Each heater 1 has two partitions 2 with a suction port 3 between the partitions 2 and discharge ports 4 disposed on opposite sides of the suction port 3 and separated from the suction port 2 by the partitions 2. A fan 6 is disposed between the partitions 2, and heaters 7 are disposed on opposite

sides of the fan 6 and are separated from the fan 6 by the partitions 2.

Kondo discloses a reflow soldering apparatus having preheating chambers 8, 9 and a reflow chamber 10 disposed above and below a belt conveyor 5. Since the three chambers 8 - 10 have substantially the same structure as each other, the preheating chamber 8 will be used as an example to illustrate the structure of the chambers 8 - 10. In Figures 2 and 3 of Kondo, which illustrate the embodiment referred to in the Official Action, a plurality of heaters 11a are disposed at outlet portions of the chamber 8. Adjoining heaters 11a are separated from each other by partition plates 12a for maintaining temperature differentials between adjoining spaces. A ventilating fan 13a draws air into the chamber 8 through flow passages 14 formed between an outer wall 8a and an inner wall 8b. The air is then passed over the heaters 11a by the ventilating fan 13a and blown at printed circuit boards 1 transported by the belt conveyor 5.

Mizoguchi discloses a reflow furnace with heaters having a blowing outlet 7 equipped with a cover comprising a multiporous metal plate 15 having two rows of holes 17 formed therein. The holes 17 decrease in diameter towards the widthwise center of the plate 15, with no holes 17 being formed at the widthwise center. According to column 5, lines 14 - 18 of Mizoguchi, the plate 15 causes hot gas to be discharged weakly through the pores in the

plate 15 and strongly through the discharge holes 17. According to column 5, lines 1 - 9 of Mizoguchi, the reason for having a stronger discharge of hot gas at the widthwise ends of the plate 15 than at the center is to increase the temperature at the widthwise ends of a printed circuit board where there is a cooling effect due to unillustrated grippers.

According to page 3 of the Official Action, it would have been obvious from Kondo to provide sloping partitions in the heater of Takahashi "since such is an art-recognized alternative of providing partitions in a reflow heater". In other words, according to the Official Action, the sloping partition plates 12a in Kondo would suggest to a person skilled in the art to make the partitions 2 of Takahashi into sloping partitions.

According to page 4 of the Official Action, it would further have been obvious from Mizoguchi "to modify the slanted plates of Takahashi so as to provide discharge plates similar to Mizoguchi in order to provide uniform heating of a substrate". It is not certain what is meant in the Official Action by "the slanted plates" of Takahashi, or exactly how the Official Action is proposing to modify the "slanted plates". However, it is assumed that by "slanted plates", the Official Action is referring to the louvers 8 which are disposed at the discharge ports 4 of the heater of Takahashi, and that "to modify the slanted plates" means to provide some sort of plates corresponding to the multiporous metal plates 15 of Mizoguchi in the vicinity of the

louvers 8.

The problem with this argument is that the references cannot reasonably be combined in a manner which would result in the arrangement set forth in claim 11.

Firstly, the Official Action states that the fact that the partition plates 12a of Kondo slope towards each other would make it obvious to have the partitions 2 of Takahashi slope towards each other. However, the partition plates 12a of Kondo perform a totally different function from the partitions 2 of Takahashi, and the fact that the partition plates 12a of Kondo are sloping does not suggest imparting a slope to the partitions 2 of Takahashi.

The partitions 2 of Takahashi separate a suction port 3 from two discharge ports 4. Gas flowing on one side of each partition 2 is suction gas, and gas flowing on the opposite side of each partition 2 is discharge gas. Thus, the partitions 2 serve to separate suction gas from discharge gas.

In contrast, the partition plates 12a of chamber 8 of Kondo are disposed in a discharge space communicating with the outlets of the chamber 8. The partition plates 12a act to create regions of different temperatures, but the gas flowing on either side of any of the partition plates 12a is discharge gas. Namely, the partition plates 12a do not separate suction gas from discharge

gas. This makes the partition plates 12a of Kondo more akin to the louvers 8 of Takahashi than to the partitions 2 of Takahashi. Since the partition plates 12 of Kondo perform totally different functions from the partitions 2 of Takahashi, the mere fact that partition plates 12a of Kondo slope so as to converge can in no way suggest that the partitions 2 of Takahashi should slope.

Secondly, the direction in which the partition plates 12a of Kondo slope is significant. Namely, the partition plates 12a of Kondo converge towards the upstream end of a discharge space of chamber 8, i.e., away from the outlets of chamber 8. Similarly, to the extent that the inner walls 8b and the outer walls 8a of the chamber 8 of Kondo converge, they converge towards the end of the chamber 8 remote from inlets and outlets of the chamber 8. The same applies to the embodiment of Figure 1 of Kondo, in which outer walls 8a and screen plates 26a converge towards the end of chamber 8 which is remote from inlets and outlets of the chamber 8.

Therefore, if a person skilled in the art were to conclude anything from Kondo about whether plates or partitions should slope, he would have to conclude that they should slope so as to converge towards the end of a chamber remote from inlets and outlets of the chamber 8. This means that if Takahashi were to be modified so that the partitions 2 of Takahashi sloped so as to converge, they would necessarily have to slope so as to converge towards the end of the heater 1 of Takahashi which is remote from

the inlets and outlets.

However, this is the opposite of the arrangement set forth in claim 11. Claim 11 states that partitions slope towards each other at an upper end of a suction chamber, and claim 11 also states that a perforated plate is provided at the upper end of each discharge chamber. Since "upper" must have the same meaning with respect to the suction chamber as with respect to the discharge chambers, it follows that the partitions of claim 11 slope towards each other at the end of the heater at which the perforated plate is installed, not at the end remote from inlets and outlets as would be the case if Takahashi were modified as proposed by the Official Action.

Thus, as a person skilled in the art could not find a reason to modify Takahashi in the manner proposed by the Official Action to impart a slope to the partitions 2, the Official Action fails to set forth a *prima facie* case of obviousness. Furthermore, since imparting a slope to the partitions 2 of Takahashi like the slope imparted to the partition plates 12a of Kondo would result in the partitions 2 of Takahashi sloping in the opposite direction from the partitions of claim 11, the cited references cannot be combined in a manner which would result in an arrangement having all the features of claim 11 and therefore cannot render this claim obvious. Claim 11 and claims 12 - 14 which depend from it are thus allowable.

New claims 15 - 18 describe additional features of the present invention. Claim 15 describes a heater including partitions sloping towards each other so that the flow area of a suction chamber decreases towards an inlet. As discussed above with respect to claim 11, the cited references do not disclose or suggest partitions which slope in this manner. Claim 15 is therefore allowable, as are new claims 16 - 18 which depend from claim 15.

Claims 7 - 10 were withdrawn from consideration as drawn to a nonelected invention. Claim 7 has been amended to depend from claim 11 by stating that it includes a heater as claimed in claim 11 disposed in each zone. Amended claim 11 is supported by Figure 1 of the drawings as filed, which shows a reflow furnace 1 having a plurality of zones 3 - 5 each having a heater 6, 7 as claimed in claim 11.

In light of the foregoing remarks, it is believed that the present application is in condition for allowance. Favorable

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consideration is respectfully requested.

Respectfully submitted,



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